Relationships among atmosphere-cryosphere-biosphere in a transitional glacial catchment (Sabbione Lake, North-Western Italian Alps)

pack instability is modeled for each massif, decreases in a range of 10-50% in mid-century to 40-80% at the end of the century according the scenarii. At that last period, no relevant value can be found in the southernmost massifs by an excessive lack of snow.

This study needs to be completed using simulations from other RCMs, which will precise the evaluation of the uncertainties of this study.

O5-23

Relationships among atmosphere-cryosphere-biosphere in a transitional glacial catchment (Sabbione Lake, North-Western Italian Alps)

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The present study has been carried out in the Sabbione Basin (North Western Italian Alps, Ossola Valley). In this area there is a storage pond (1.226 km^2) which gathers the ablation waters of the glaciers situated within the site; the main glaciers are the North Sabbione Glacier (ca. 1.25 km^2) and the South Sabbione Glacier (ca. 2.50 km^2).

Climatological, geomorphological and vegetational studies have been conducted in order to understand the connections between the climate change and its possible effects on the cryosphere, geosphere and biosphere.

We have analysed air temperature, liquid and solid (snow fresh) precipitation recorded in the meteorological stations of Formazza - Pian dei Camosci (2,453 m above sea level, from 1988 to 2012) and Sabbione (2,470 m above sea level, from 1950 to 2012), located within the study area. The results have been related to the previous studies available for the Ossola Valley in order to better investigated the trends of the main climatic parameters in the context of climate change, with particular attention to the amount of snowfall, thickness and persistence of snow cover. In addition, we have analysed some stratigraphic profiles of snow cover (AINEVA) and snow density data recorded in the automatic/manned meteorological stations of Meteomont Service (Corpo Forestale dello Stato and Comando Truppe Alpine) for the characterization of the snowpack.

A detailed geomorphological map (scale 1:10000) has been created from the aerial photographic interpretation of multitemporal images and digital orthoimages (from 1955 to 2010). Moreover, field surveys have been conducted (during the summer 2012) with the aim to identify micromorphological forms resulting from cryotic remodelling processes on deposits (eg. patterned ground, cryoturbation ecc).

Vegetational samples for grassland and for debris deposits have been taken with the phytosociological method, in order to characterize the main habitats to produce a preliminary map of vegetation.

To determine the presence/absence of permafrost the model Permaclim (Guglielmin et al., 2003) has been applied and it has been implemented in a plug-in in open GIS (QGIS software), developed especially for this study. This model uses as input data a Digital Terrain Model (DTM), climate data (air temperatures and distribution of snow - the latter assessed by analysis of Landsat satellite data) and characteristics of the snowpack deriving from field measurements (sensible heat measured and thermal snow conductivity calculated from snow density measurements).

The model results have been compared with the geomorphological map, which shows the forms resulting from superficial cryotic processes and temperatures measurements BTS (Bottom Temperature of Snow cover). Furthermore, the delay in the phenological development of Artemisia genepi, that grow on areas with permafrost, has been investigated in order to observe the relationships among climate change, cryosphere and biosphere.

O5-24

Trend analysis of snow water equivalent in the Alpine region

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The temporary storage of water in form of snow plays an important role in the water cycle. It impacts the seasonal discharge and the water supply in many areas of the world. The regional and annual variability of SWE is important for the maximum snow load codes or the hydropower industry, which is interested in detailed forecasts of the discharge for efficient energy production. In spring the snow water equivalent (SWE) is of particular significance to forecast the magnitude of snowmelt runoff to issue possible flood warnings.

In this study we analyze the long-term variability and trends of SWE measurements at roughly 50 stations to determine how climate change impacts the snow water resources. The measurement sites are located between 500 and 2500 m asl in Austria, Germany, Italy, Switzerland and France. Almost two dozen of these sites are operational since 60+ years. Mid-winter and spring snow pack trends have been investigated separately. The results reveal that the majority of the stations show non-significant negative trends in all regions. The strongest relative trends are observed in spring at low altitude.

O5-25

Recent changes in avalanche activity in the French Alps and their links with climatic drivers: an overview

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Natural avalanches are directly controlled by snow and weather parameters. Hence, they are intuitive high altitude proxies whose changes result from a mixed temperature